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TWO NEW SPECIES OF *FORMICA* FROM WESTERN UNITED STATES

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BY WILLIAM STEEL CREIGHTON

Since the publication of Wheeler's 'Revision of the Ants of the Genus *Formica*' in 1913 there have been but two additional species described from the United States. This condition reflects the extensive nature of Wheeler's work and, in addition, indicates the considerable difficulty of specific recognition in this group. The strong similarity of worker belonging to several species in the genus *Formica* makes this caste very recalcitrant to satisfactory separation. Despite the uniformity of structure which marks the worker, the females of *Formica* usually possess distinct specific characters that can be easily recognized and are entirely suitable for taxonomic purposes. Wheeler utilized this fact when he established the "*microgyna* group," in which the diminutive female does not exceed the largest worker in size. The females of each of the species described in this paper possess certain morphological features that do not occur elsewhere in the genus. One in particular is worthy of special consideration since its stature approaches the small size characteristic of the *microgyna* female yet it is unquestionably a slave-maker belonging to the *sanguinea* complex. It is a pleasure to give to this unique insect the name of the man whose studies in the genus *Formica* wll always be the cornerstone for future work on the American species.

Holotypes, ergatotypes, and a series of paratypes of each are deposited in The American Museum of Natural History.

Formica wheeleri, new species

Figure 1

WORKER.—Length 6.5 mm. Head, exclusive of the mandibles, trapezoidal, broadest just behind the eyes with the straight sides narrowed from that point to the insertion of the mandibles. Occipital angles only slightly rounded, the median portion of the occipital border virtually straight. Clypeus with a rather narrow median lobe which is moderately convex in a lateral plane and more feebly convex from front to back. The median lobe of the clypeus is abruptly set off from the lateral portions and, although not unusually long, projects abruptly beyond them in front. Clypeal notch broad and deep. Clypeal carina very feeble. Frontal area triangular, broader

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than long, scarcely depressed, feebly shining in the middle, more strongly shining at the periphery with a very faint median carinula extending a short way from the median angle. Frontal lobes short, parallel, and acutely pointed in front. Frontal furrow virtually obliterated. Eyes oval, moderately convex, their anterior border situated slightly in front of the middle of the side of the head. Mandibles stout, strongly convex in two planes and bearing seven teeth on the masticatory

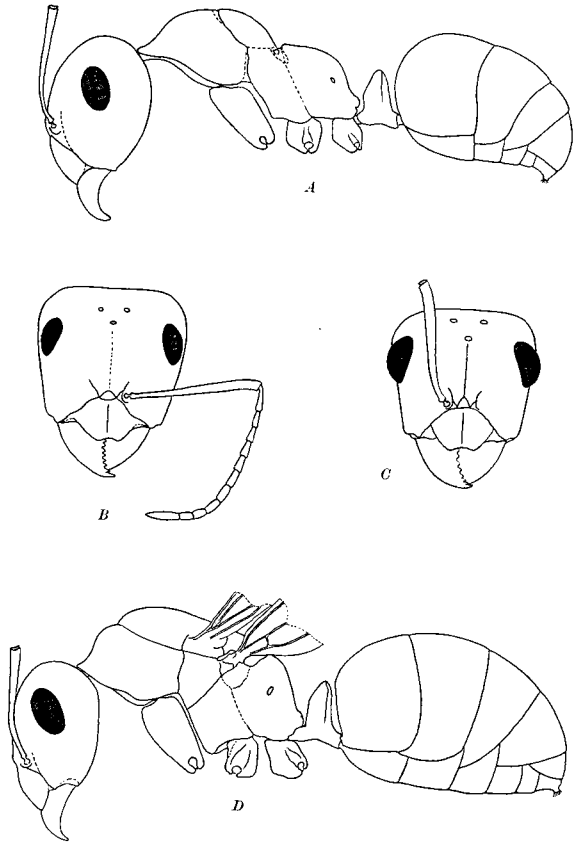

Fig. 1. *Formica wheeleri*, new species.

A. Profile view of worker; B. Head of worker; C. Head of female; D. Profile view of female. All drawings made to same scale.

margin. Antennal scapes rather stout, evenly thickened from base to apex and only slightly curved. In repose the tip of the scape surpasses the occipital margin by a distance equal to twice its thickness. All funicular joints longer than thick, joints 1–4 each increasing in diameter from base to apex, joints 5–10 somewhat thicker than the preceding joints and cylindrical in shape, the terminal joint as long as the two preceding joints together and tapering toward the apex.

Thorax in profile with the promesonotum forming a single even convexity, the promesonotal suture scarcely enough impressed to break the outline. Mesoëpinotal suture narrowly and not very deeply impressed. Epinotum notably higher than long, the basal face very slightly convex, the angle between it and the declivous face well-marked and only slightly rounded. Seen from above, the thorax is stout. The pronotum has a short, stubby anterior neck and very convex sides. It is almost twice as wide as the shield-shaped dorsum of the mesonotum. Sides of the thorax at the meso-epinotal suture only slightly constricted. Behind the constriction the lower portions of the mesonotum and epinotum are parallel. Scale of the petiole low, blunt, and wide. Seen in profile, the anterior face consists of a very short, perpendicular portion at the base that passes through a broad though well-marked angle to the long upper face. The latter slopes backwards to the blunt crest. The straight posterior face slopes slightly backwards from crest to base and is feebly convex in a lateral plane. Upper edge of the node entire and only a little convex in the middle. Abdomen large but rather slender and pointed behind. Legs long with stout femora but slender tibiae and tarsi.

Front, vertex, occiput, entire thorax, and the scale of the petiole finely and densely shagreened and opaque. Genae and lower surface of the head more feebly shagreened, shining with numerous coarse but shallow punctures. Middle portion of the clypeus feebly shining with very fine longitudinal striae. Mandibles longitudinally striate, the striae coarser than those on the clypeus and the surface more shining. Antennal scapes, femora, and tibiae feebly shagreened and somewhat shining. Abdomen evenly shagreened but more shining than the thorax.

Erect hairs moderately numerous, short, pointed, and yellow. Most numerous on the clypeus and front, sparser and shorter on the vertex, absent on the occiput except for one or two very short median hairs. A tuft of erect hairs occurs on the dorsum of the pronotum, a few shorter ones are present on the mesonotum, and one or two occur at the angle between the two faces of the epinotum. Erect hairs on the abdomen much more numerous than elsewhere. They are evenly scattered over the entire surface of each of the abdominal segments but become more numerous and longer on the posterior segments. Mandibles, coxae, and femora of the fore legs and the flexor surfaces of the middle and hind femora with very fine, short, erect hairs. Pubescence fine, short, and golden. Sparse on the head, thorax, and legs where it is visible only in certain lights. Much more abundant on the abdomen but not thick enough to conceal the shagreened surface beneath. Dense on the antennal scapes and funiculi.

Thorax, petiole, legs, antennae, and lower surface of the head dull, yellowish brown. Vertex and occiput piceous brown. Abdomen a deeper piceous brown with the edges of the segments narrowly edged with black. Pronotum and mesonotum faintly tinged with irregular splotches of brown.

VARIATION WITHIN THE TYPE SERIES.—This series consists of thirty-four workers from the same colony as the ergatotype. The length varies from 5–6.5 mm. In the small individuals the sides of the head are slightly convex and the occipital border is perfectly straight. In such cases the epinotum is lower and the scale of the petiole is proportionally narrower. Slight color variations also occur, but these have nothing to

do with size and are, apparently, due to the age of the insect. Thus in some workers the piceous coloration of the upper surface of the head is confined to the occiput. In such individuals the abdomen is a lighter brown than that of the ergatotype.

FEMALE.—Length 7 mm. Eyes a little larger than those of the worker, strongly convex with their outline extending beyond the side of the head when this is viewed from the front. Frontal furrow more pronounced than in the worker. The antennal scape in repose surpasses the occipital margin by an amount almost three times its greatest thickness. Funicular joints thicker than those of the worker. In other respects the head is like that of the ergatotype.

Thorax seen from above suboval, almost as wide as the head, widest a little in front of the insertion of the fore wings. Scutum slightly broader than long, subpentagonal in outline with the median anterior angle broadly rounded. Scutellum with a feebly arcuate anterior edge and a rather strongly convex posterior border, the lateral projections narrow and long but blunt at the tip. Metanotum small, not extending entirely across the dorsum of the thorax. Seen in profile, the suture between the pronotum and the scutum is well-marked so that the slightly concave, sloping, anterior face of the pronotum is sharply set off from the descending anterior portion of the scutum. The epinotum is only a little lower than the adjacent portion of the thorax, much higher than long, and with the angle between the short, basal face and the long, declivous face well marked Scale of the petiole much thicker at the base than in the worker and with a very much blunter upper edge. Abdomen oval, slender, and pointed behind. Legs shorter and somewhat stouter than those of the worker. Wings grayish white with veins and stigma brown.

Sculpture and pilosity as in the worker.

Piceous brown, the mandibles, legs, and antennae clear, yellowish brown. Clypeus sordid yellow infuscated along the midline. Pronotum and petiole sordid yellow irregularly clouded with piceous brown. The black bands that border the abdominal segments are less conspicuous than in the worker.

Two winged females were taken in the original colony. Except that it is a trifle smaller (6.7 mm.), the second female agrees in every respect with the holotype.

TYPE LOCALITY.—Warner Ranger Station, La Sal Mountains (9500 feet elevation), Utah. These mountains, which are close to the Utah-Colorado border, lie about fifteen miles to the southeast of the town of Moab.

Slave.—*F.* (*Proformica*) *neogagates* subspecies *lasioides* variety *vetula* Wheeler.

In addition to the type series, I have taken this ant in the Blue Mountains (some maps give these as the Abajo Mountains) which lie to the west of Monticello, Utah. This nest, as well as that of the type series, was situated on an open hillside surrounded by extensive aspen groves. The nests are constructed under stones without any accumulation of earth or vegetable detritus.

The cephalic characteristics and coloration of *wheeleri* leave no room for doubt concerning its relationship to *emeryi* and *pergandei*. Through the generosity of Dr. W. M. Wheeler, I have been able to compare the new species with types of his *emeryi*. The workers of the two species differ as follows: in *wheeleri* the head is broader, the profile of the promesonotum is more convex, the epinotum is shorter and higher and more sharply set off from the promesonotum, the constriction of the sides of the thorax at the mesoepinotal suture is feebler, the scale of the petiole is broader and thicker with the upper edge less angular and blunter. In addition, *wheeleri* is more heavily sculptured, has more numerous erect hairs and more abundant pilosity, especially on the abdomen. The differences shown by the female of *wheeleri* are much more striking. Its small size and unusually dark coloration serve to distinguish it not only from *emeryi* but also from all the other known females in the *sanguinea* group. The possibility of confusion in the case of this insect is so slight that it seems unnecessary to give additional characteristics for its recognition.

Formica curiosa, new species

Figure 2

WORKER.—Length 5.5 mm. Head, exclusive of the mandibles, slightly longer than wide, the moderately convex sides more strongly narrowed in front of the eyes than behind them. Occiput flat in the middle with the occipital angles strongly rounded. Eyes rather small, moderately convex, with their posterior border very slightly in front of the level of the median ocellus. The eyes are set well down on the sides of the head so that when the head is viewed directly from in front the eyes break the outline of the side of the head. Clypeus strongly convex both in the antero-posterior and the lateral plane. A small but distinct median, longitudinal carina is present. Clypeal notch well marked, broad but only moderately deep. Frontal area broadly triangular, scarcely depressed and somewhat shining. Frontal lobes short with their lateral margins diverging behind. Frontal furrow feeble but extending back to the median ocellus. Antennal scapes stout, gradually thickened from base to apex. In repose the scape surpasses the occipital border by one quarter of its length. Funicular joints all longer than thick, joints 1–6 each slender at the base but thickened apically, joints 7–10 cylindrical, terminal joint more slender and longer than the preceding joints. Mandibles small, their masticatory margin armed with eight teeth.

Thorax, seen from above, rather slender, the pyriform promesonotum barely one and one quarter times as wide as the epinotum, the sides only moderately constricted at the mesoëpinotal suture. Seen in profile, the pronotum is evenly convex with the promesonotal suture well marked by the raised anterior edge of the mesonotum. The dorsum of the latter descends through an even curve to the broadly and shallowly impressed mesoepinotal suture. Basal and declivous faces of the epinotum of equal length, the angle between them well marked and not much rounded.

Scale of the petiole seen in profile thick at the base but sharp at the crest, the posterior face straight and perpendicular, the anterior face sharply bent in the middle with upper half sloping back to the crest of the scale. Seen from behind, the scale flares strongly from the base to the upper edge. The latter is moderately convex with a very feeble notch in the middle. The basal half of the anterior face of the scale is very convex in a lateral plane. This convexity decreases in that portion of the

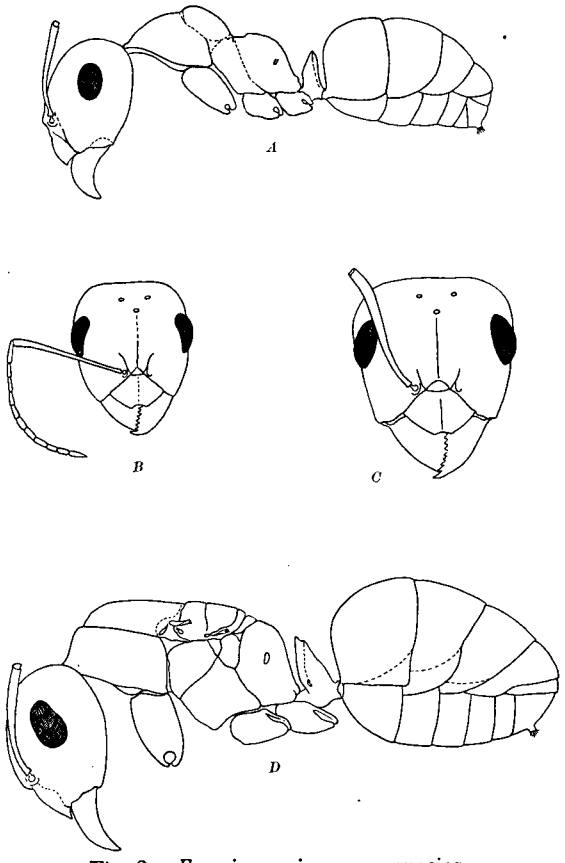

Fig 2. *Formica curiosa*, new species.
A. Profile view of worker; B. Head of worker; C. Head of female; D. Profile view of female. All drawings made to same scale.

anterior face which slopes backwards to the crest of the scale. Abdomen bulky and oval. Legs long and stout with the femora slightly curved.

Thorax finely and densely shagreened, opaque; upper surface of the head and the coxae more feebly shagreened, somewhat shining; under surface of the head, the femora and tibiae very feebly shagreened, rather strongly shining and with sparse piliferous punctures; mandible punctatostriate, feebly shining.

Erect hairs short, yellow, and rather blunt, not numerous except on the abdominal segments. A few hairs are present on the clypeus, front, vertex, genae, and the dorsum of the pronotum. The angle of the epinotum and the crest of the petiole bear several somewhat shorter erect hairs. Erect hairs of the abdomen longer, more even and more abundant than elsewhere. Fore coxae and all three pairs of femora covered with rather sparse, short, fine, erect, and suberect hairs. These form a definite row on the flexor surface of each tibia and first tarsal joint and grade into pubescence on the apical tarsal joints. Pubescence absent on the head and the thorax; sparse on the lower surface of the head; more abundant on the coxae, particularly the middle and hind pair, and the antennae; very abundant on the abdomen where it forms an even gray investiture but is not thick enough to conceal entirely the shining surface beneath.

Head, thorax, petiole, and appendages yellowish red. Abdomen brown with the edges of the segments more or less tinged with black.

VARIATION WITHIN THE TYPE SERIES.—This series consists of one hundred and fifty-two workers from the same colony as the ergatotype. The length varies from 4.5–5.5 mm. The smaller workers show the same characteristics as the ergatotype. With one exception the structure throughout the type series is remarkably constant. The exception is found in the outline of the crest of the petiolar scale. In the ergatotype this bears a small, scarcely noticeable, median notch. In other specimens of the type series this notch is absent, and the crest of the scale forms an even convexity. In still others, instead of an evenly convex crest, there is a distinct, obtuse median angle. There appears to be no correlation between these variations and the size of the individual.

FEMALE.—Length 8.5 mm. Sides of the head less convex than in the worker, the head only slightly narrowed behind the eyes, the occipital angles well marked and not much rounded. Eyes a little larger than in the worker, subpyriform in outline. The antennal scape in repose surpasses the occipital border by an amount only slightly in excess of its greatest thickness. In other respects the head of the female has the same characteristics as that of the worker.

Thorax, seen from above, oval, four-fifths as wide as the head, widest at the insertion of the fore wings, the sides tapering slightly behind this point. Scutum slightly longer than wide, scutellum subtrapezoidal. Seen in profile, the pronotum is almost twice as thick as the rather flattened scutum. The anterior third of the latter is convex, but the posterior two-thirds are perfectly flat. Scutellum feebly convex and slightly higher than the adjacent portion of the scutum. Metanotum small, straplike, and slightly depressed. Epinotum narrow and high with a short, sloping basal face passing through a rounded angle to the much longer, perpendicular, declivous face.

Sculpture and pilosity as in the worker.

Uniform yellowish red, the abdomen no darker than the head and thorax, except at the posterior border of each segment where there is a narrow band of blackish brown.

In addition to the holotype, two other dealated females were taken in the same colony. These show slight differences in pilosity. The erect hairs are much sparser, particularly on the anterior abdominal segments which are virtually hairless. In addition, the abdominal pubescence is notably sparser, resulting in a feebly shining surface for that area. Although there are two of these less pilose females to one which shows the heavier pilosity, the author has chosen to regard the latter as typical. Its pilosity approximates the condition found throughout the large series of workers, and, moreover, the lack of body hairs on the other two females is what might be expected in the case of an old female or one which had met with difficulties during the nest-founding period.

TYPE LOCALITY.—Lake McGregor, Montana. This is a small lake about thirty-five miles west of Kalispell.

Slave.—*F.* (*Proformica*) *neogagates* subspecies *lasioides* variety *vetula* Wheeler.

This ant was taken by the author on July 13, 1934. My field notes concerning it are as follows: "Nest in sandy soil under small stone in open pine woods near edge of lake. Slaves numerous. It is not particularly pugnacious but very inquisitive. Tends to collect in small clusters when disturbed. Relatively little brood in the nest."

The worker of *curiosa* resembles in many respects the minor worker of *sanguinea* subspecies *aserva* Forel. Since *curiosa* is virtually monomorphic, there is very little reason or the confusion of the two forms, if adequate material is available for comparison. In addition to this obvious means for separation, there are others which will apply regardless of the size of the specimens. The eyes of *curiosa* are more convex than those of *aserva* and lie nearer the genae; the scale of the petiole is sharper and narrower in *curiosa*, and its median notch, when present, is far feebler than that of *aserva*. In the case of the female of *curiosa*, we have a very simple means for specific diagnosis. As has been noted above, the color of this insect is a uniform yellowish red. When the female of *bradleyi* is discovered, it may become necessary to apply some other distinction, but until that time the concolorous female of *curiosa* is unique for the *sanguinea* group.